Support schemes and risk premiums for renewable energy technologies

Morthorst, Poul Erik; Grenaa Jensen, Stine

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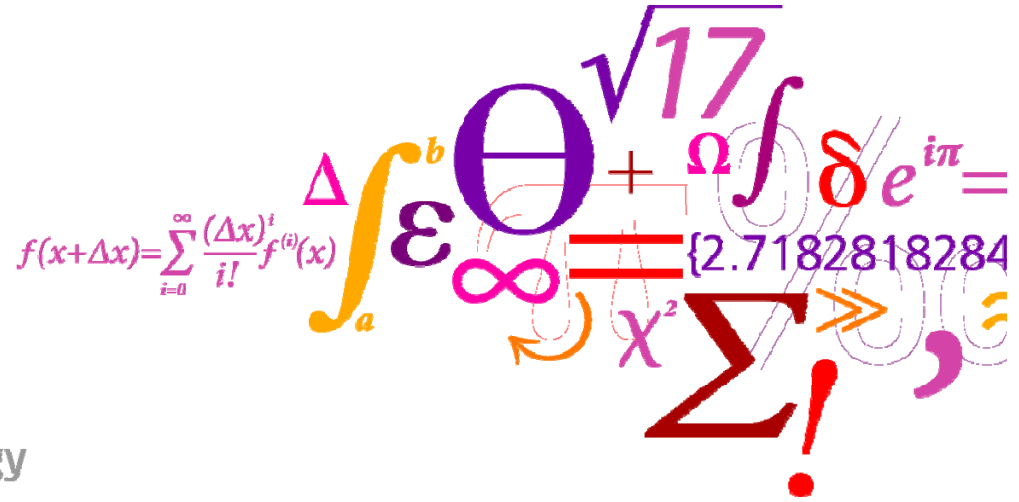
Support Schemes and Risk Premiums for Renewable Energy Technologies

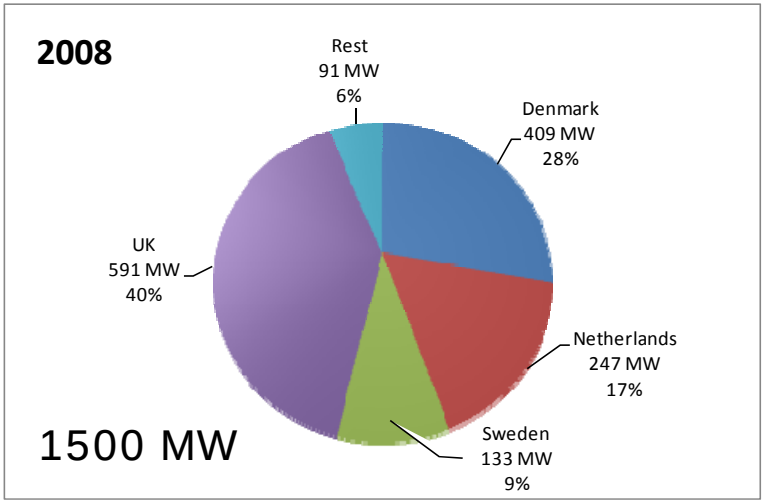
Poul Erik Morthorst, Risø DTU
Stine Grenaa Jensen, Danish Energy Association

14.September 2009



Risø DTU
National Laboratory for Sustainable Energy

Offshore Wind Power Development



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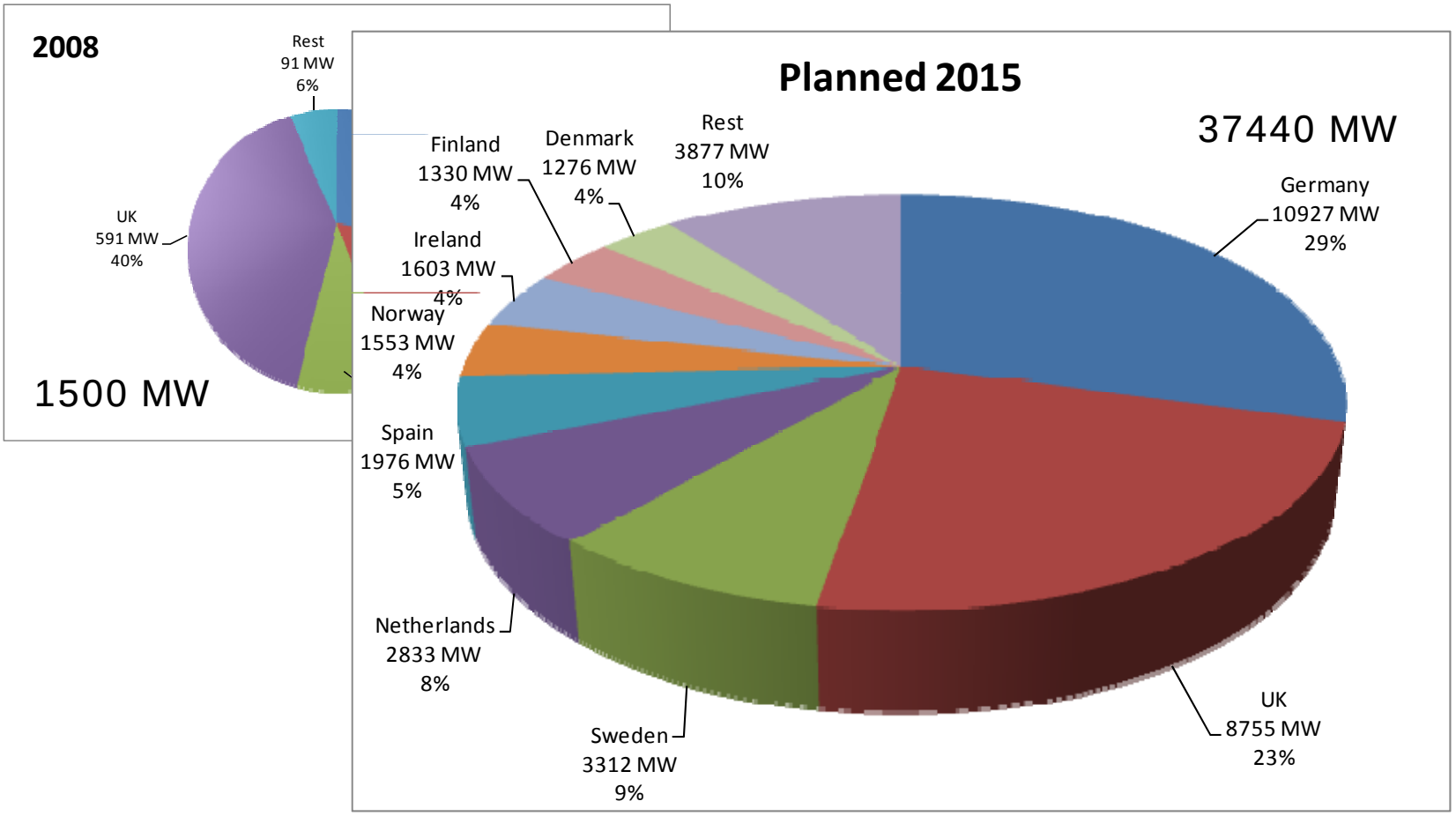
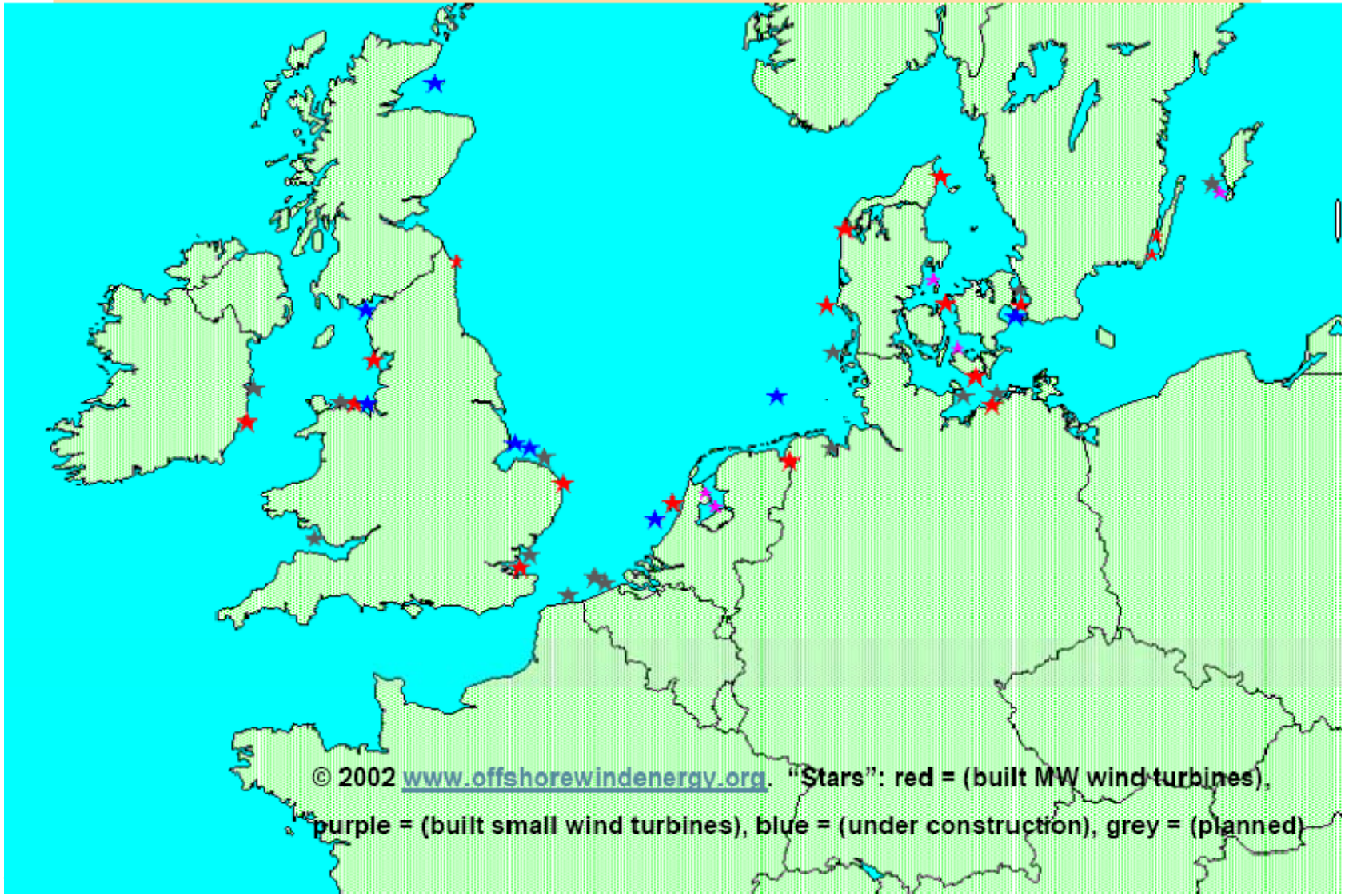


Offshore Wind Farms – Built and Planned



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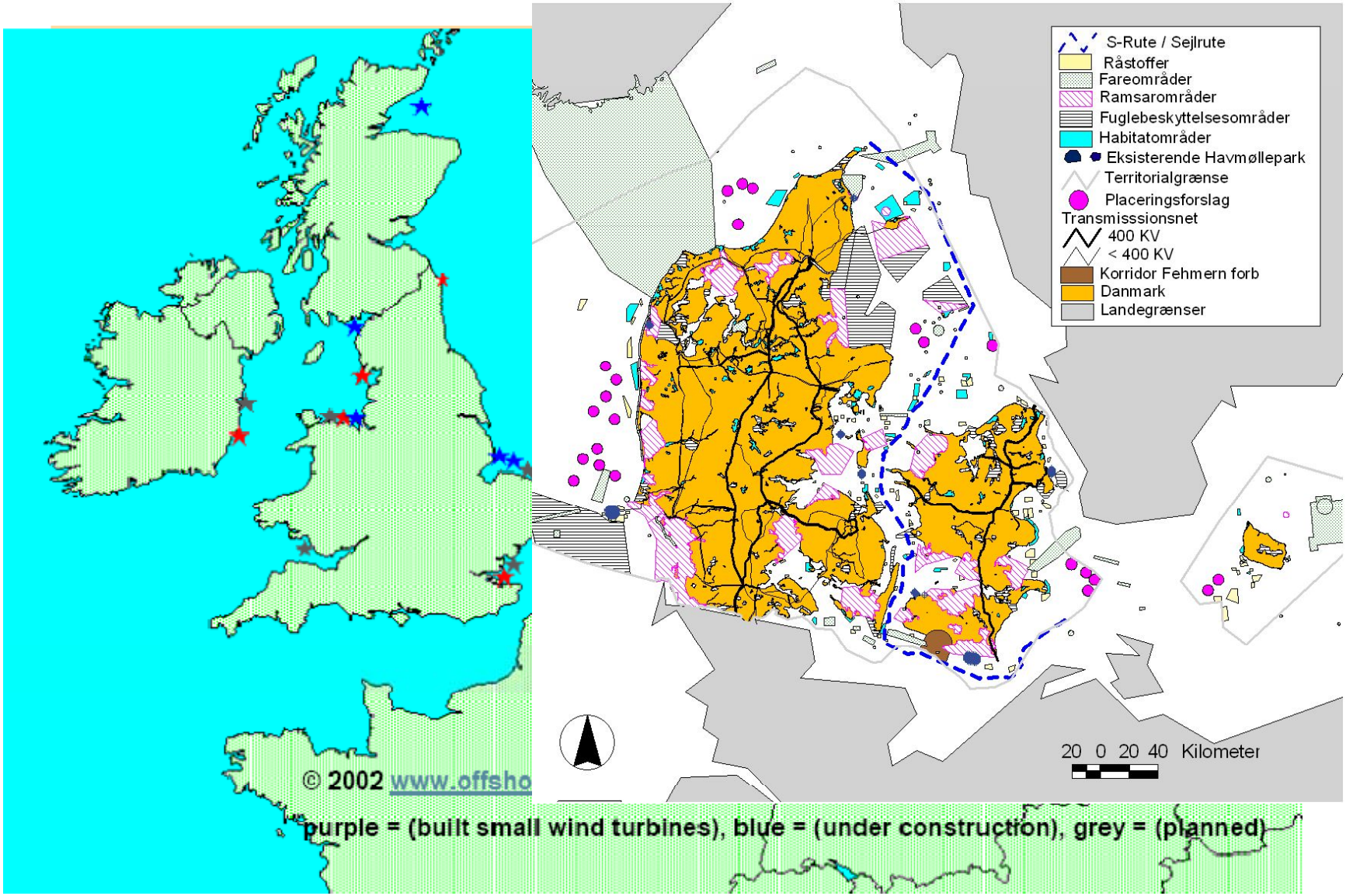

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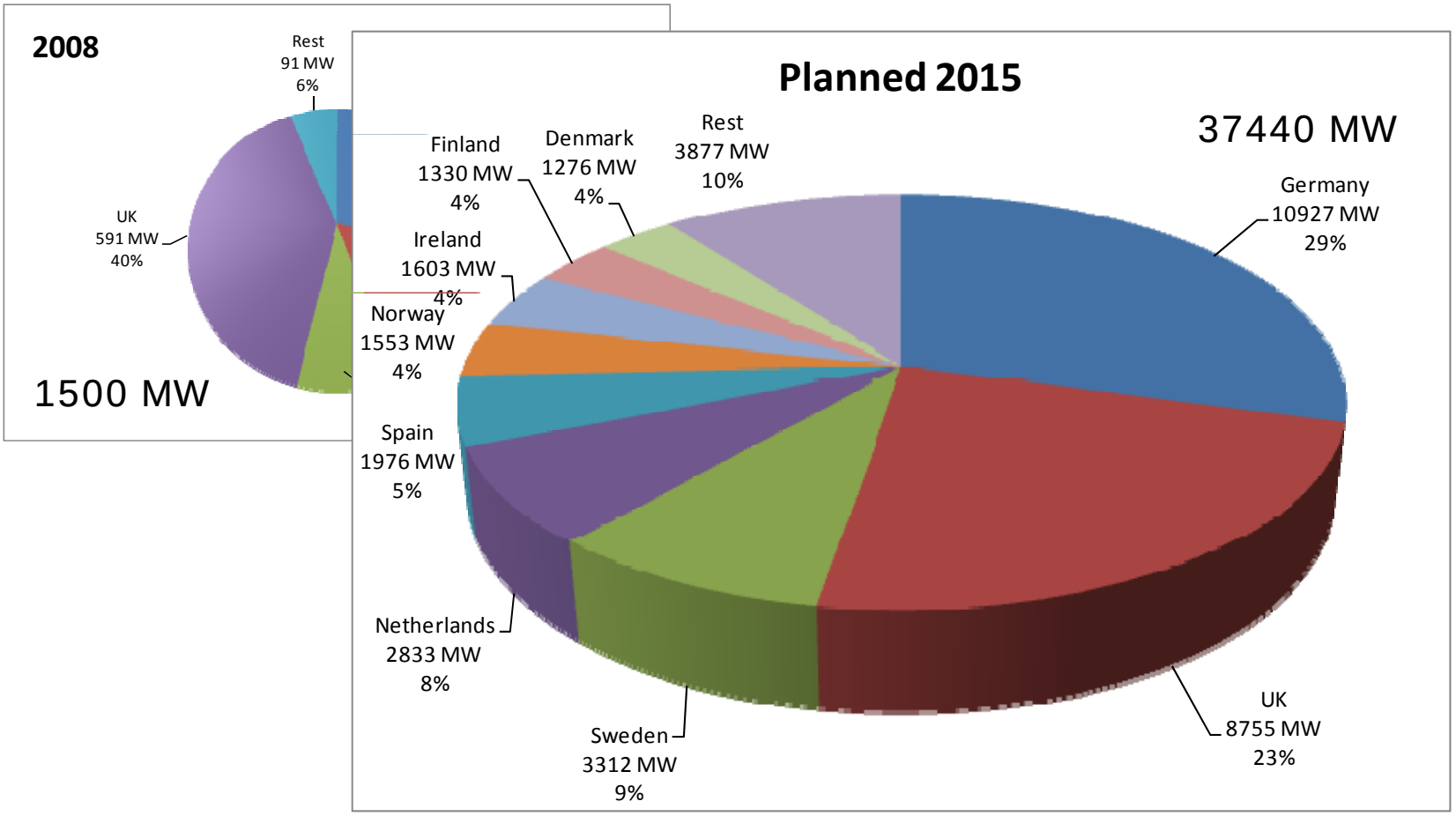

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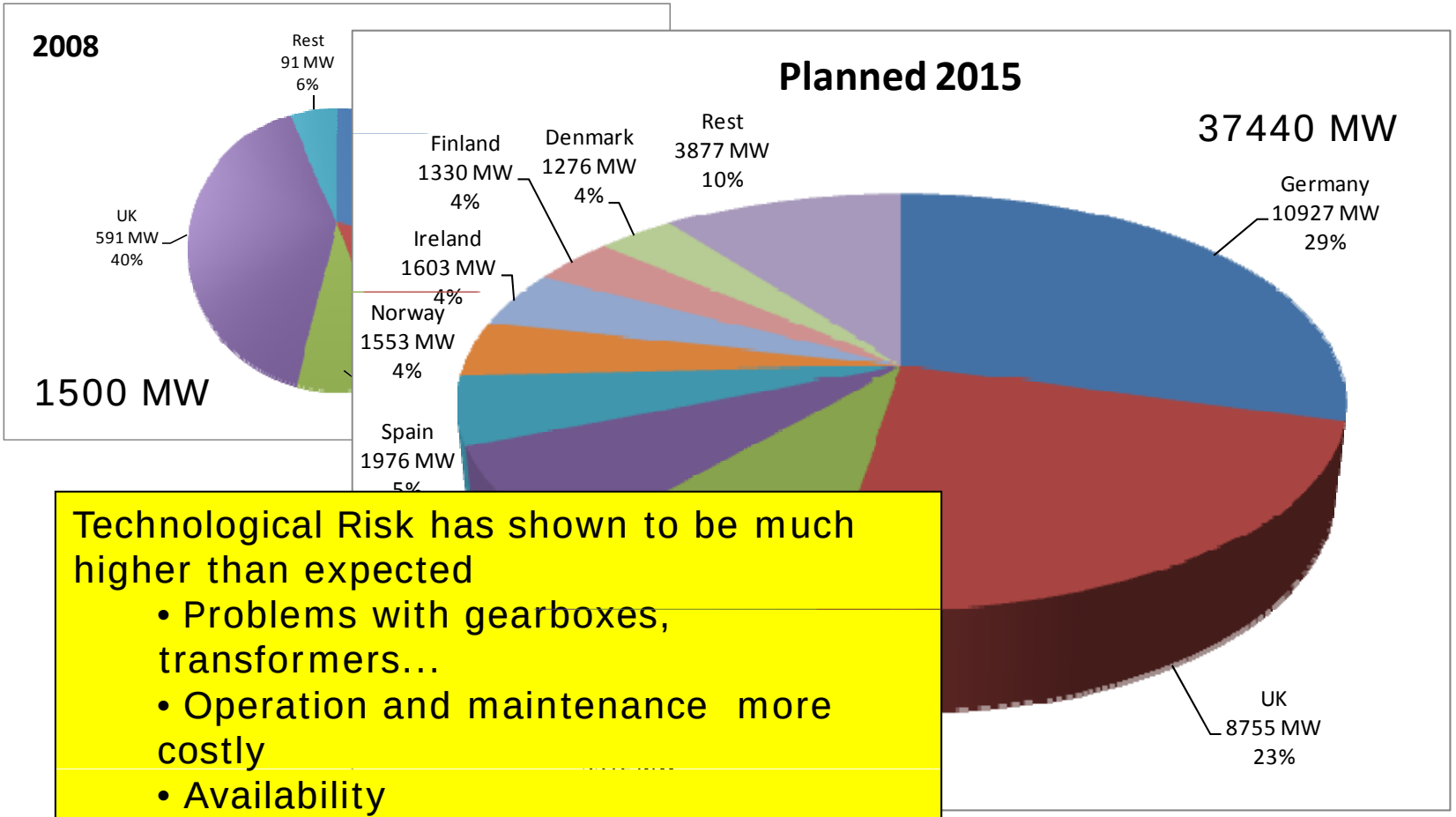


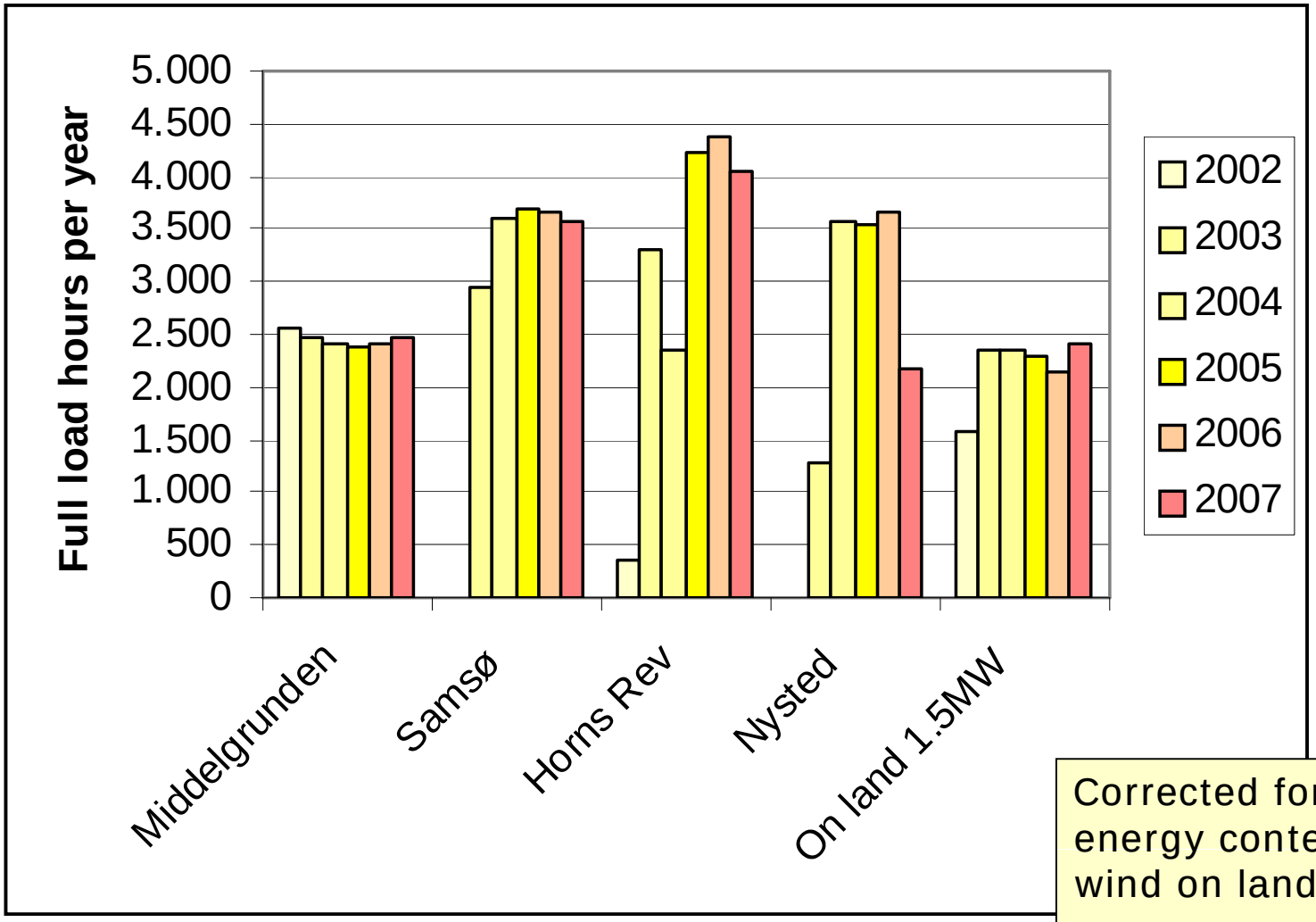
Technological Risk has shown to be much higher than expected

- Problems with gearboxes, transformers...
- Operation and maintenance more costly
- Availability

Risk and Uncertainty

- **Technological Risk**
  - Investment Costs
  - Maintenance Costs
  - Production
  - Availability
  - Lifetime
- **Regulatory Risk**
  - Support Levels
  - Market design
- **Market Risk**
  - Power price
  - Competition
  - Fuel prices
  - ....

Experiences until now with Offshore wind power production



Corrected for energy content in wind on land

Risk and Uncertainty

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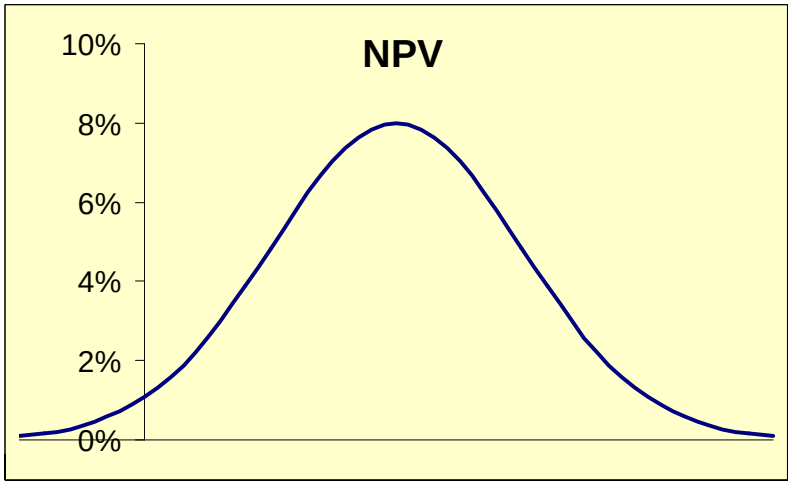
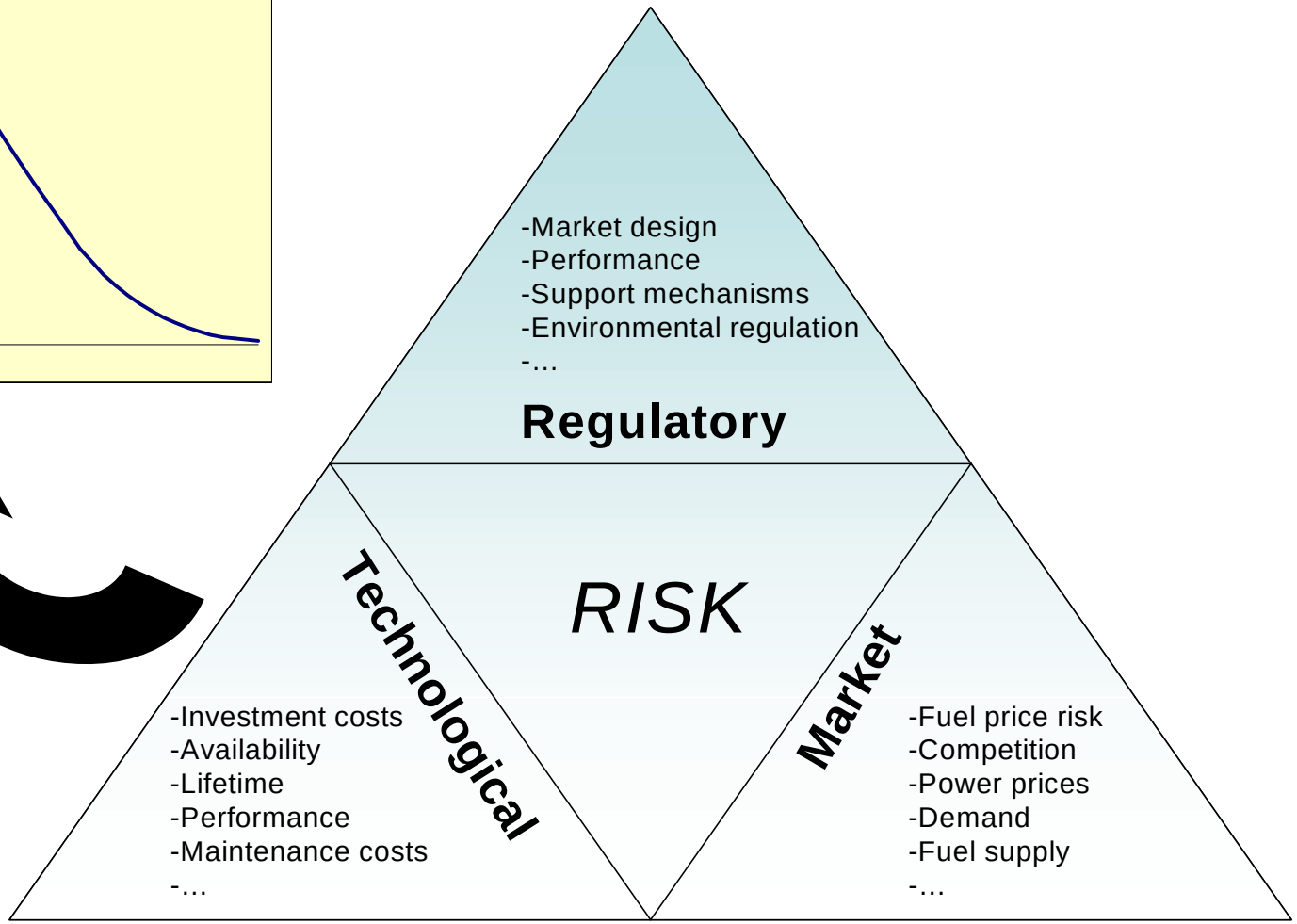


Uncertainty in Return of Investment



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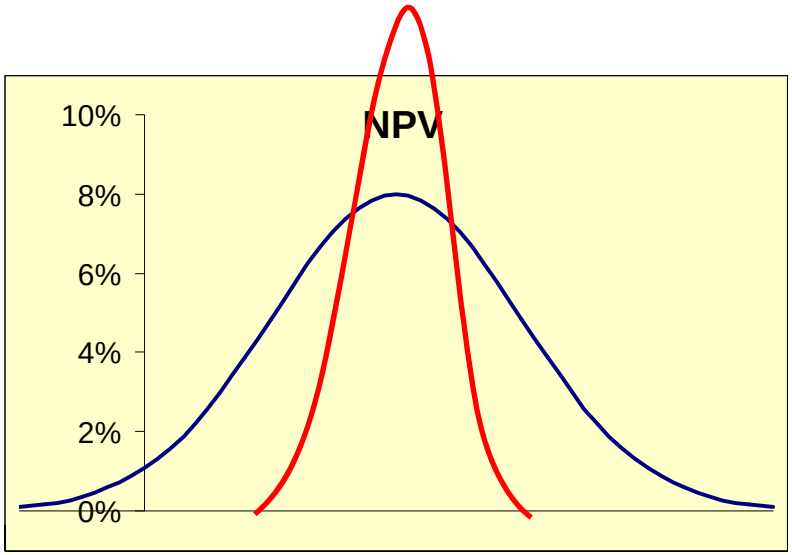
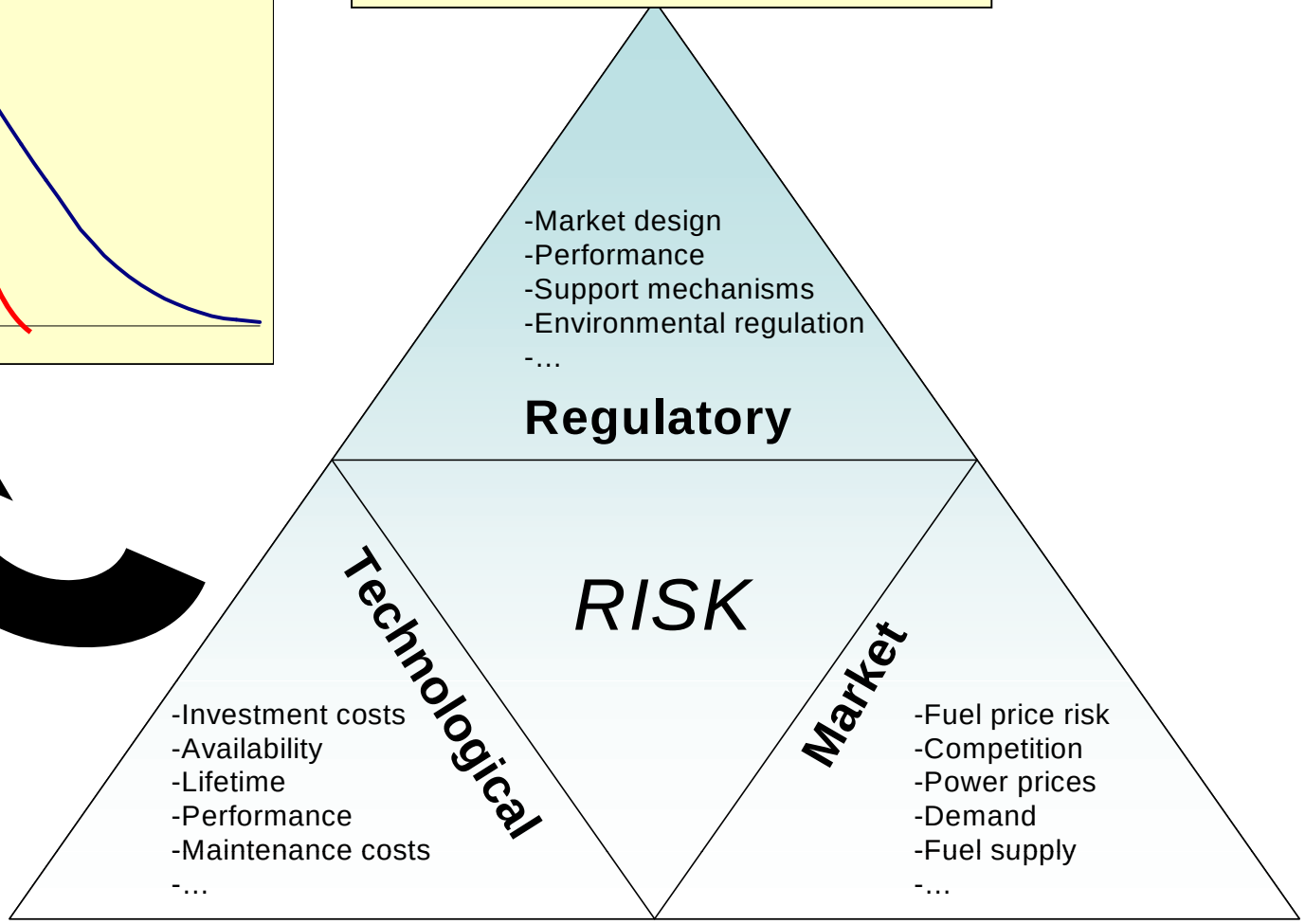


Uncertainty in Return of Investment

Ex ante optimisation



Ex ante optimisation

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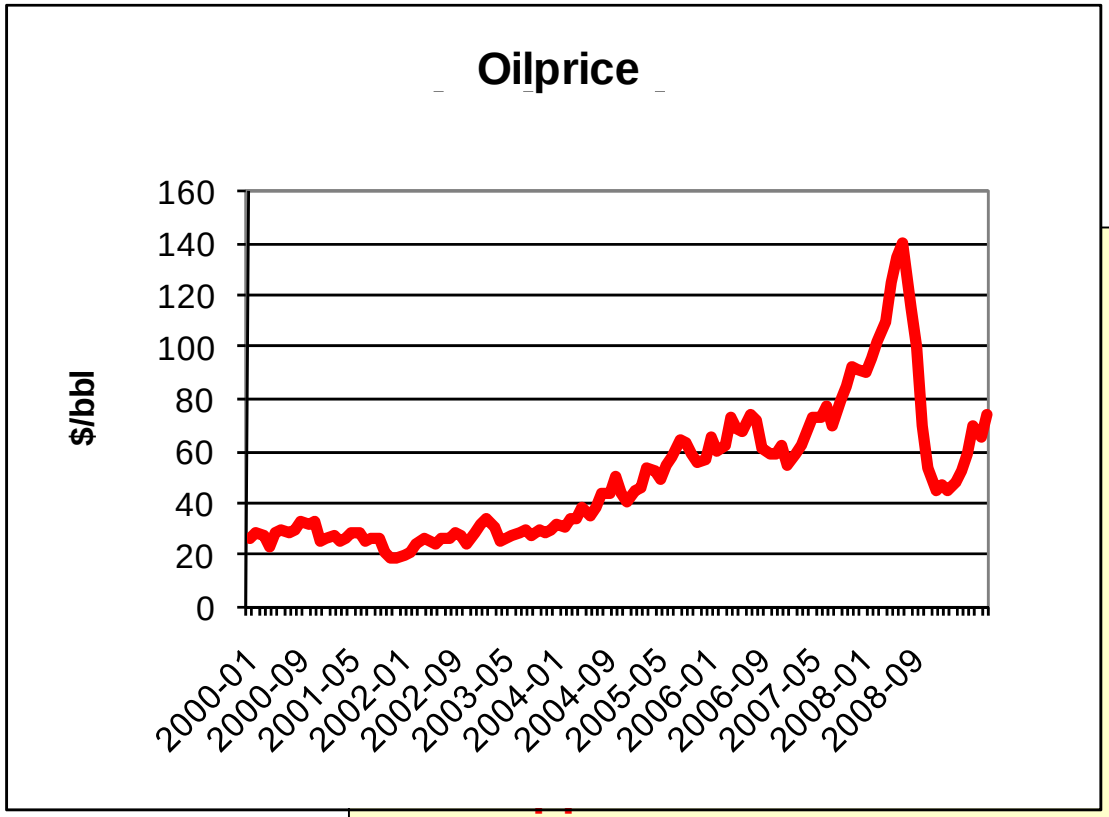

- **Market design**

- **Market Risk**
  - **Power price**
  - **Competition**
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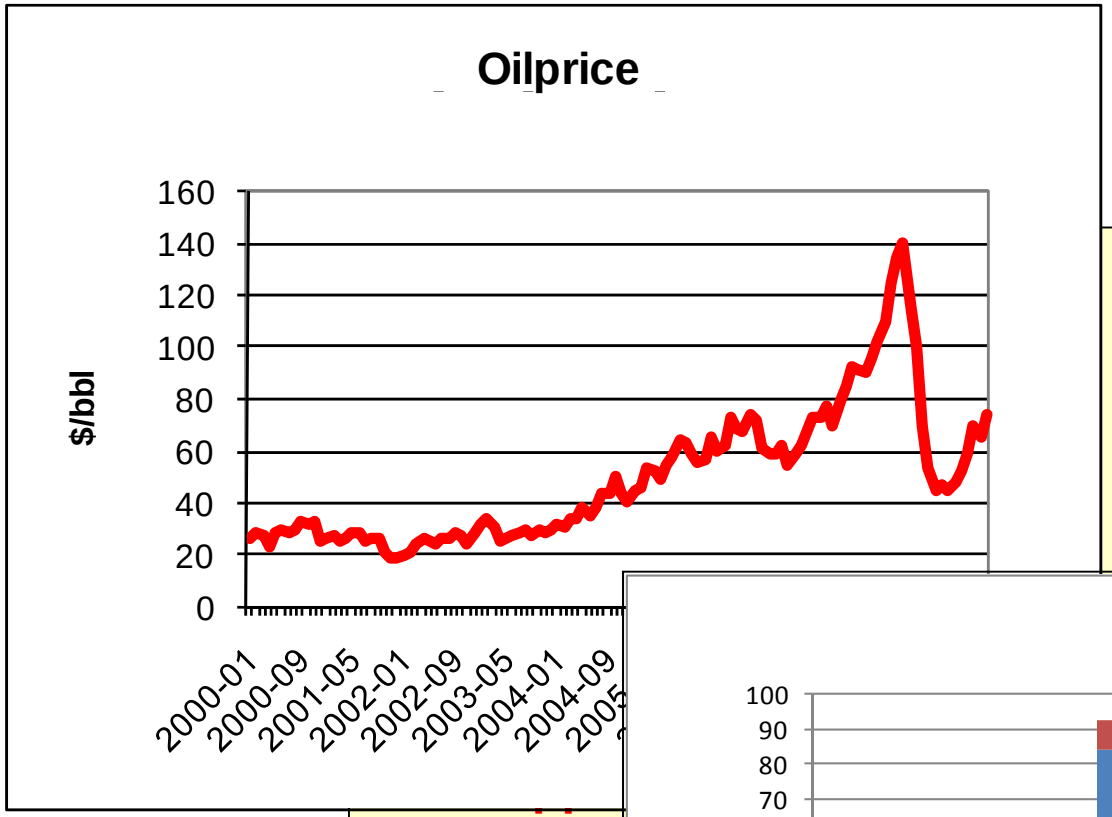
  - **....**



– Market

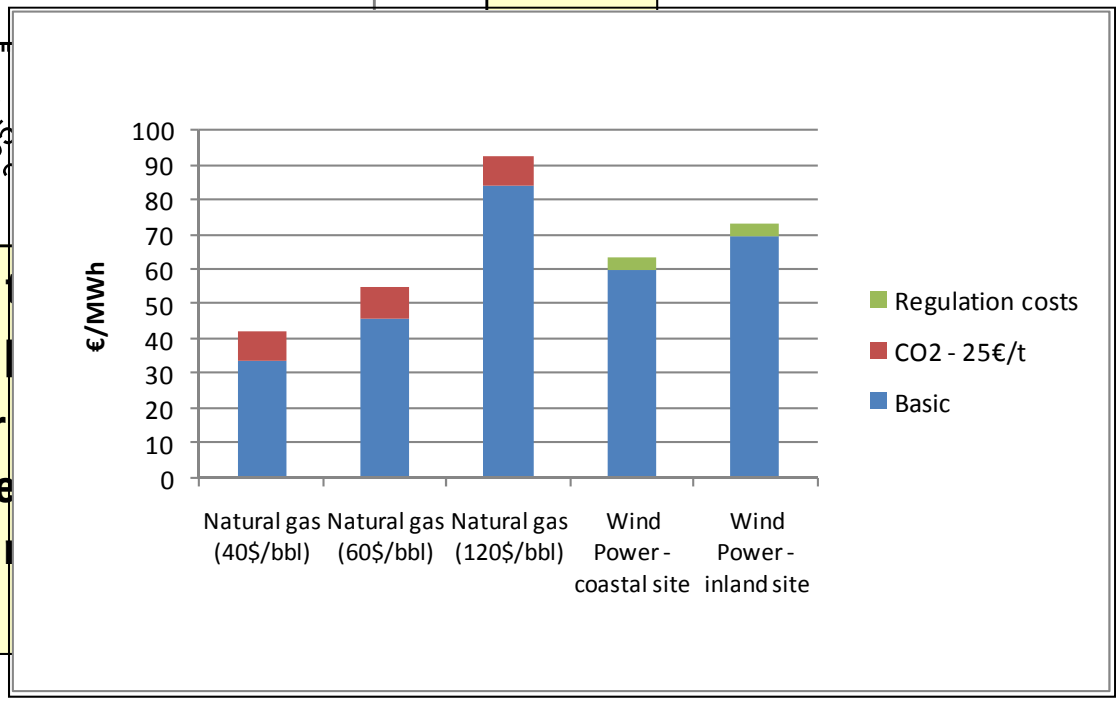
• Market

– Power

– Compe

– Fuel pr

– ....



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Ex-post optimisation

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Ex post

When the turbine is established the sum of Risks is (almost) constant

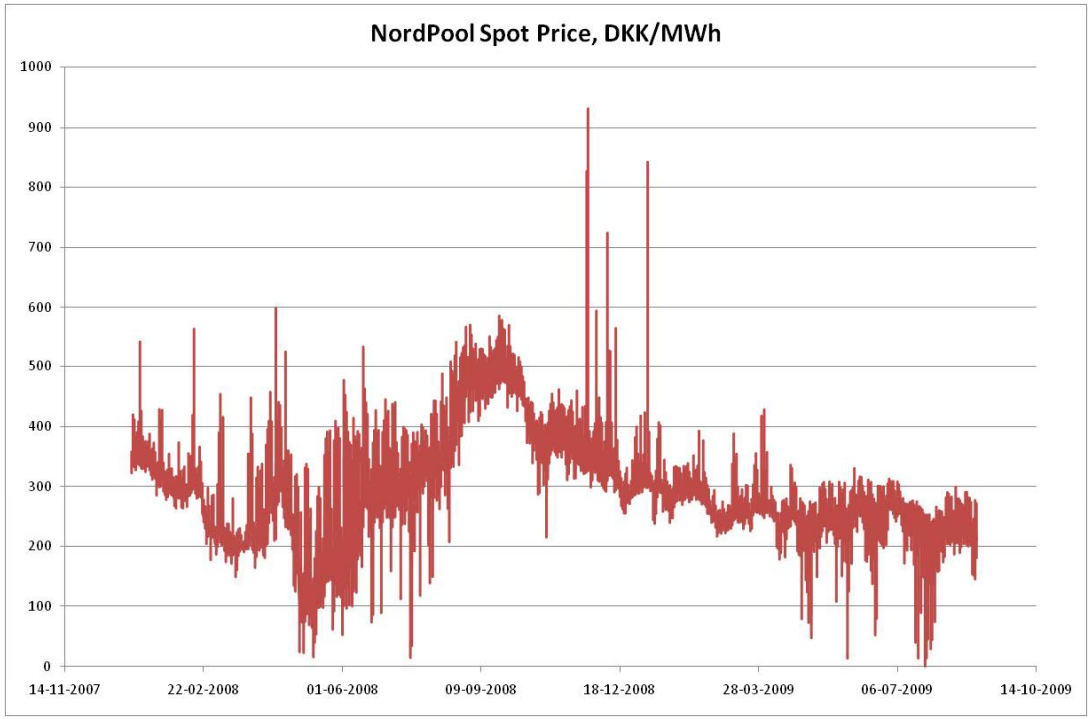
- **But we can pay somebody else to bear the risk for us**
  - *We can hedge the power price*
  - *We can agree on a prepaid service contract*
  - *We can buy a production warranty*
- **... and, of course, some companies are more suited than others for taking risks**

Comparison of two support systems:

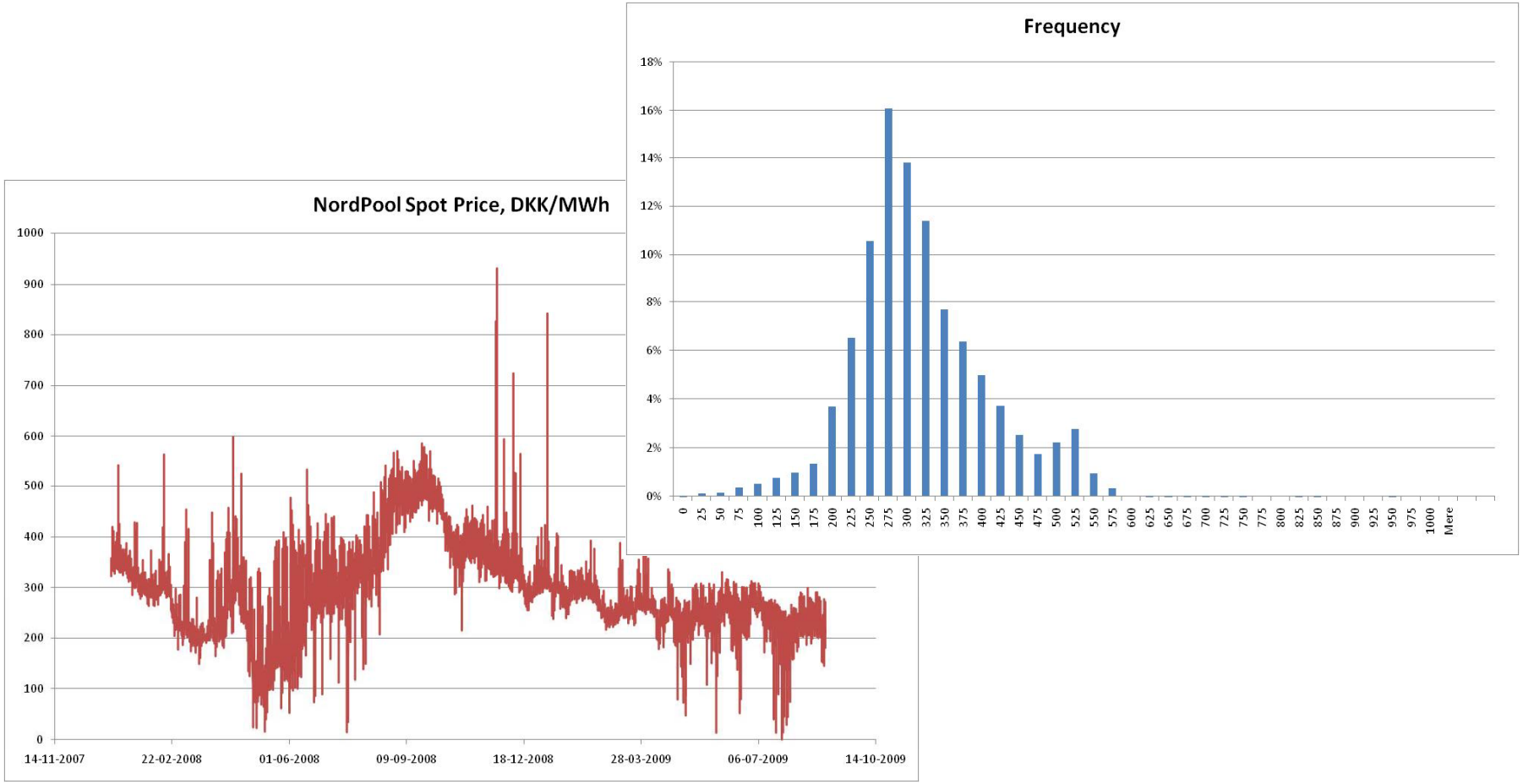
- A premium system and a fixed feed-in system
- Two actors: The private investor and the state

• Power price (average):	50 €/MWh
• Power price (std.):	5 €/MWh (10 %)
• Premium:	34 €/MWh
• Fixed feed-in:	84 €/MWh
• Duration:	44,000 Full Load Hours
• Discount rate:	6 %
• Production:	4000 h/MW/year

Development of Power Price



Development of Power Price



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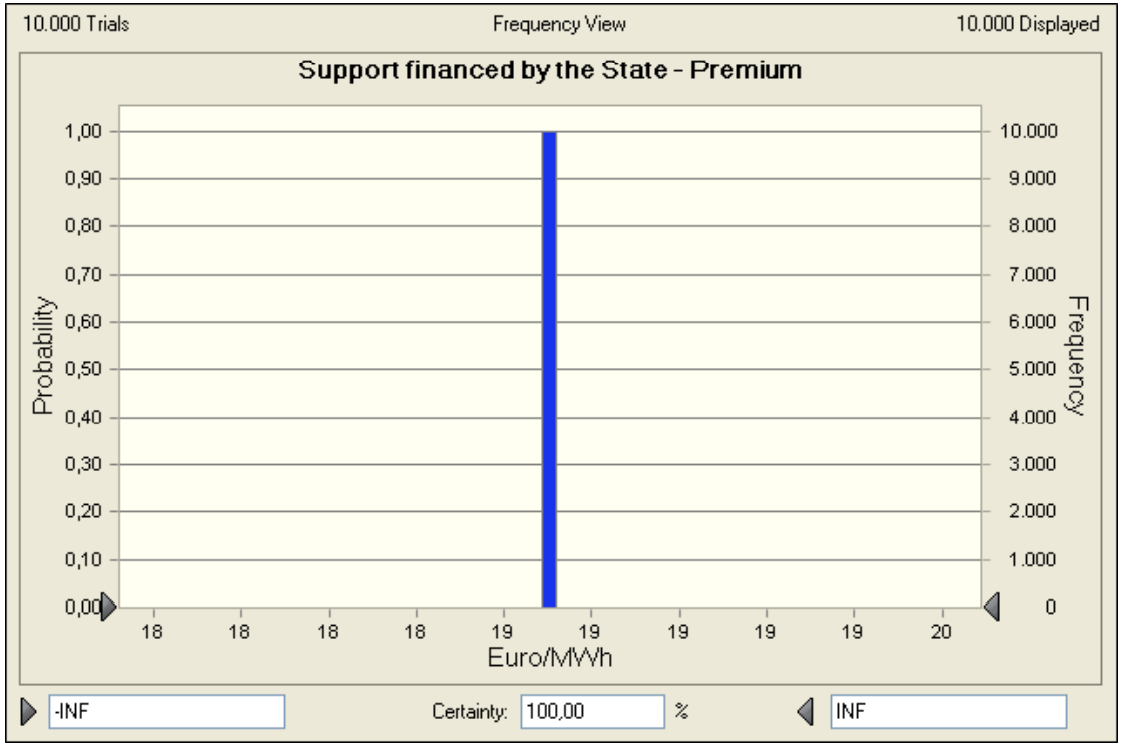
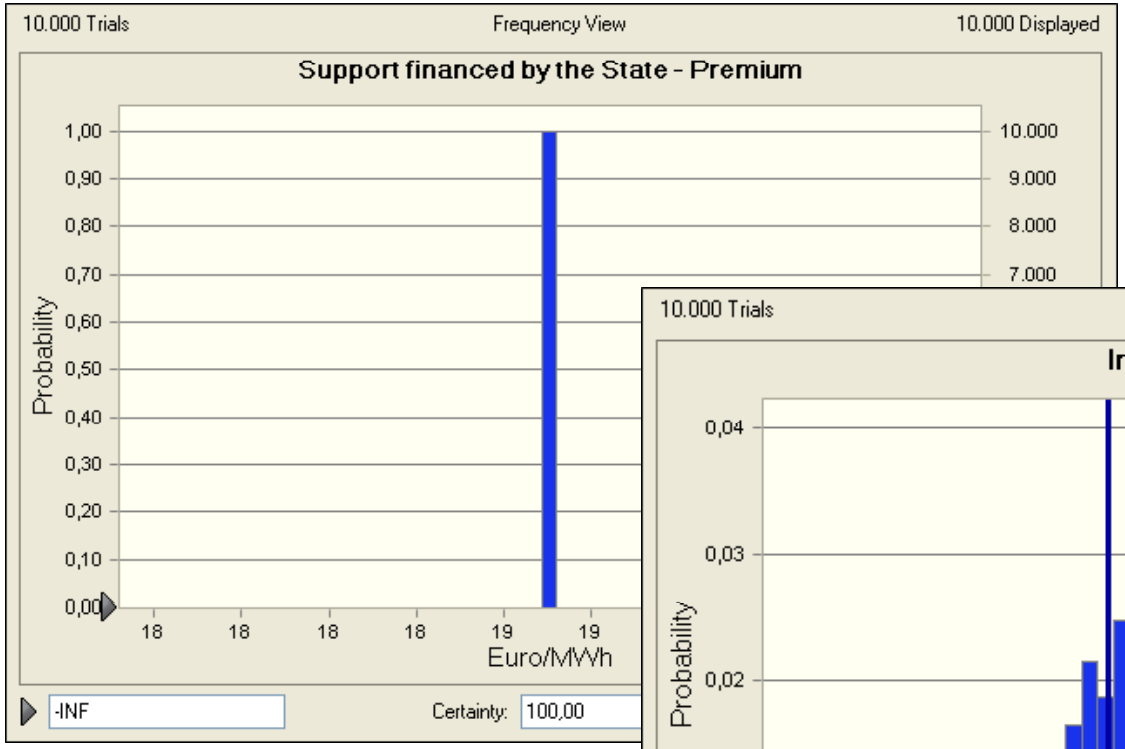
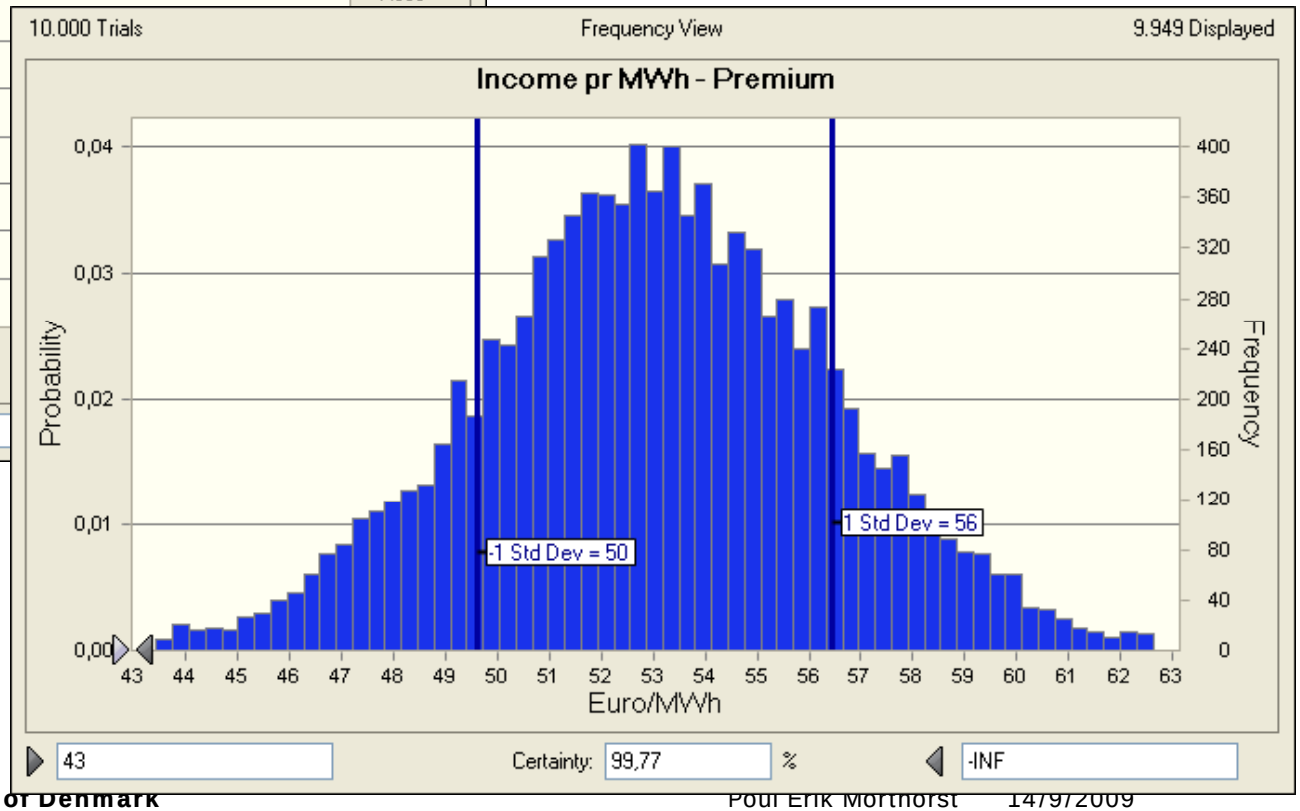
Premium Feed-in

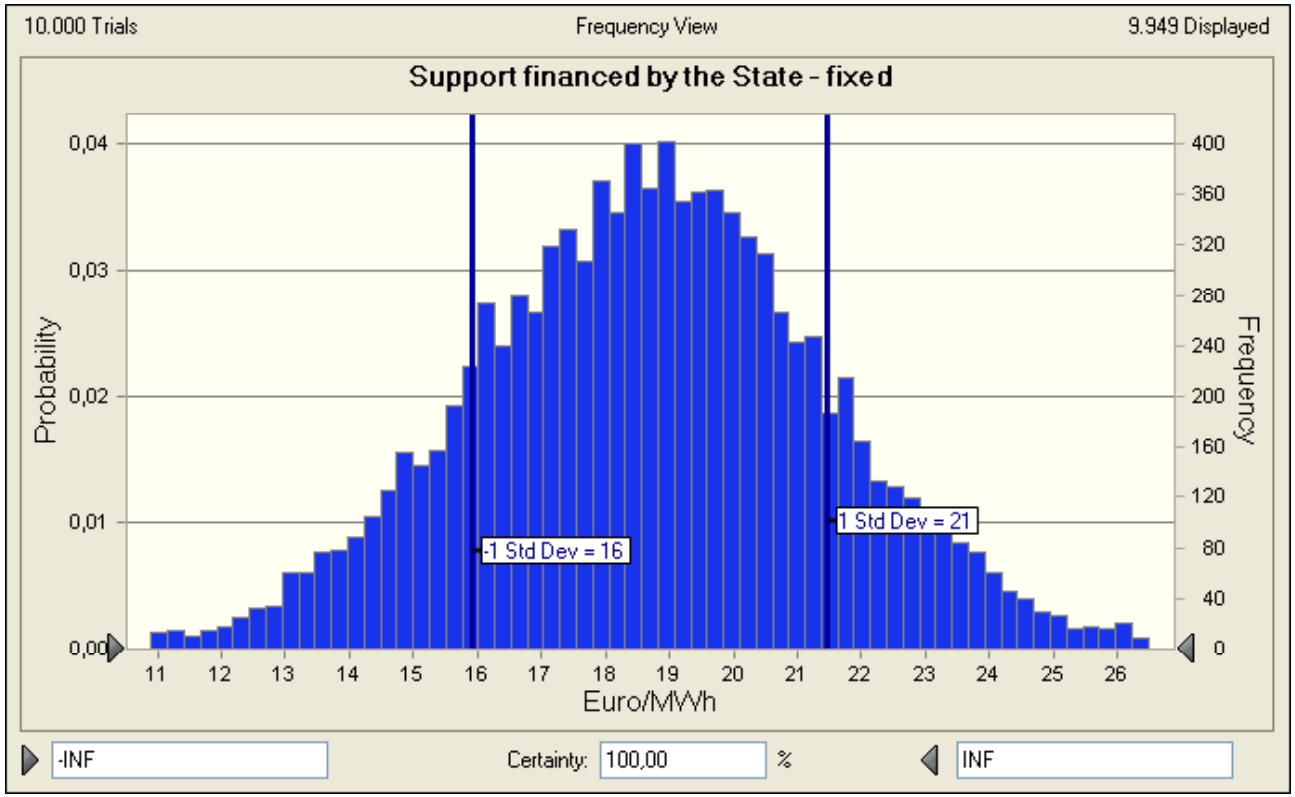


Premium Feed-in

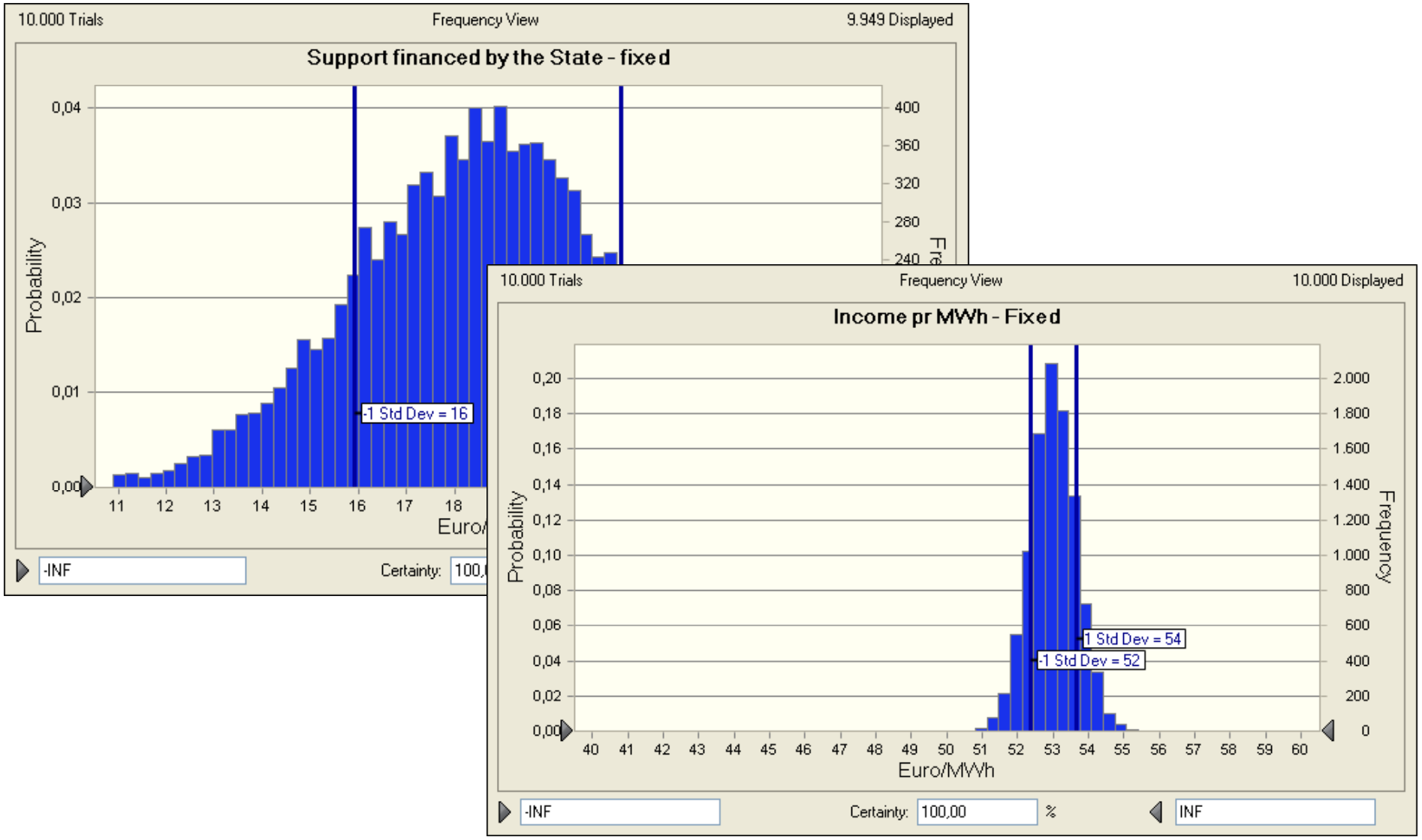




Fixed Feed-in



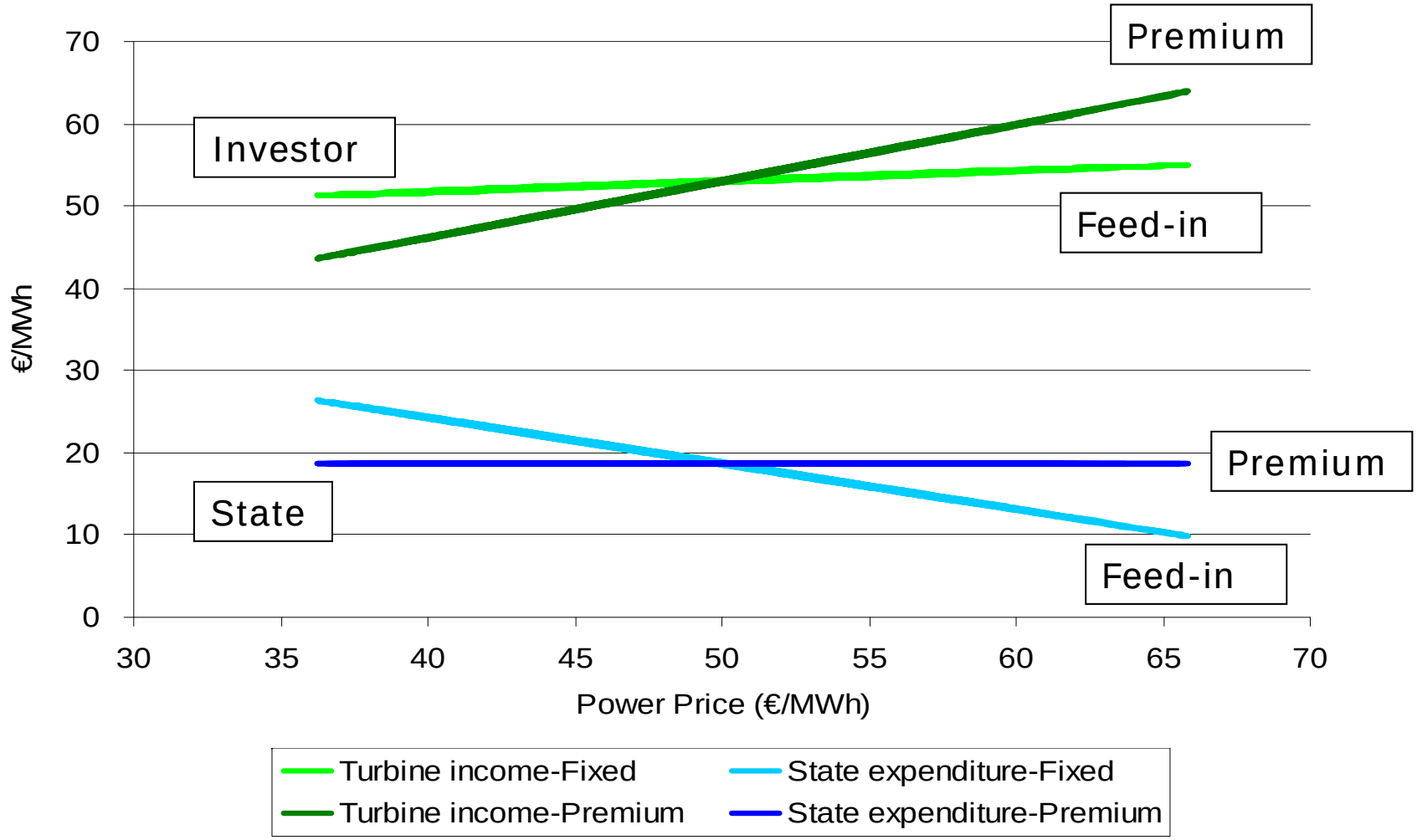
Fixed Feed-in



Risk for the State and the turbine owner

		State	Turbine
Support	Premium	0	3.42
	Fixed	2.78	0.64

Correlation between Price and Support



Conclusions

- **After the turbine is established the sum of risks is constant**
  - *But some companies/organisations might be better suited to bear the risk*
- **A premium system might for the private investor have a five-fold higher risk than a feed-in system**
  - *The state bears a high risk in the feed-in scheme*
- **If the state bears part of the risk this might imply a lower risk premium for society at large**